Name: ____ Date: ____________________

Polynomial Operations SOLUTIONS (version 2)

1. Let polynomials $p(x)$ and $q(x)$ be defined below.

$$p(x) = 6x^5 - 8x^3 + x^2 - 5x - 7$$

$$q(x) = 3x^5 - 6x^4 + 8x^3 - 10x + 1$$

Express the sum of $p(x) + q(x)$ in standard form.

Get "unsimplified" forms. Then find $p(x) + q(x)$ with addition/subtraction.

$$\begin{aligned} p(x) &= (6)x^5 + (0)x^4 + (-8)x^3 + (1)x^2 + (-5)x^1 + (-7)x^0 \\ q(x) &= (3)x^5 + (-6)x^4 + (8)x^3 + (0)x^2 + (-10)x^1 + (1)x^0 \\ p(x) + q(x) &= (9)x^5 + (-6)x^4 + (0)x^3 + (1)x^2 + (-15)x^1 + (-6)x^0 \\ p(x) + q(x) &= 9x^5 - 6x^4 + x^2 - 15x - 6 \end{aligned}$$

2. Let polynomials $a(x)$ and $b(x)$ be defined below.

$$a(x) = 6x^2 - 7x + 8$$

$$b(x) = -4x - 5$$

Express the product $a(x) \cdot b(x)$ in standard form.

You can use a table for multiplication.

*	$6x^2$	$-7x$	8
$-4x$	$-24x^3$	$28x^2$	$-32x$
-5	$-30x^2$	$35x$	-40

$$a(x) \cdot b(x) = -24x^3 + 28x^2 - 30x^2 - 32x + 35x - 40$$

Combine like terms.

$$a(x) \cdot b(x) = -24x^3 - 2x^2 + 3x - 40$$

3. Express $(x+1)^6$ in standard (expanded) form.

Remember the binomial theorem. It tells us to use Pascal's triangle.

$$x^6 + 6x^5 + 15x^4 + 20x^3 + 15x^2 + 6x + 1$$

Polynomial Operations SOLUTIONS (version 2)

4. Let polynomials $f(x)$ and $g(x)$ be defined below.

$$\begin{aligned} f(x) &= 6x^3 - 25x^2 + 4x + 6 \\ g(x) &= x - 4 \end{aligned}$$

The quotient of $\frac{f(x)}{g(x)}$ can be expressed as a polynomial, $h(x)$, and a remainder, R (a real number).

$$\frac{f(x)}{g(x)} = h(x) + \frac{R}{x-4}$$

By using synthetic division or long division, express $h(x)$ in standard form, and find the remainder R.

I prefer using synthetic division.

$$\begin{array}{c|cccc} & 6 & -25 & 4 & 6 \\ 4 & & 24 & -4 & 0 \\ \hline & 6 & -1 & 0 & 6 \end{array}$$

So,

$$\frac{f(x)}{g(x)} = 6x^2 - x + \frac{6}{x-4}$$

In other words, $h(x) = 6x^2 - x$ and the remainder is $R = 6$.

5. Let polynomial $f(x)$ still be defined as $f(x) = 6x^3 - 25x^2 + 4x + 6$. Evaluate $f(4)$.

You could do this the hard way.

$$\begin{aligned} f(4) &= (6)\cdot(4)^3 + (-25)\cdot(4)^2 + (4)\cdot(4) + (6) \\ &= (6)\cdot(64) + (-25)\cdot(16) + (4)\cdot(4) + (6) \\ &= (384) + (-400) + (16) + (6) \\ &= 6 \end{aligned}$$

Or, if you reference the polynomial remainder theorem, you can state that you know $f(4)$ equals the remainder when $f(x)$ is divided by $x - 4$. Thus, $f(4) = 6$.